

CLAIMS

- 1 1. A method of forming a Ge-containing structure comprising:
 - 2 providing a substrate having a first and a second surface;
 - 3 forming a Ge based layer over said first surface; and
- 4 forming a stress engineering layer over said second surface so as to increase the tensile
- 5 strain of the Ge based layer over the first surface.
- 1 2. The method of claim 1, further comprising forming a Ge based layer over said second
- 2 surface before forming the stress engineering layer.
- 1 3. The method of claim 2, wherein the step of forming the stress engineering layer
- 2 comprises forming a germanide layer using the Ge based layer formed over said second
- 3 surface.
- 1 4. The method of claim 3, wherein the step of forming the germanide layer comprises
- 2 depositing a Ti layer on the Ge based layer formed over said second surface and forming
- 3 the germanide layer via solid phase reaction.
- 1 5. The method of claim 1, wherein the step of forming the stress engineering layer
- 2 comprises forming a silicidation layer over said second surface.
- 1 6. The method of claim 2, further comprising removing the Ge based layer over said
- 2 second surface before forming the stress engineering layer.
- 1 7. The method of claim 1, wherein said substrate comprises Si.
- 1 8. The method of claim 2, wherein said Ge based layers are formed using ultra-high
- 2 vacuum chemical vapor deposition (UHV-CVD).
- 1 9. The method of claim 1, wherein said Ge based layer comprises Ge layers.
- 1 10. The method of claim 1, wherein said Ge based layer comprises SiGe layers.
- 1 11. The method of claim 5, wherein forming said silicidation layer further comprises
- 2 depositing a Ti layer on said second surface of said substrate by evaporation and then
- 3 annealing at high temperature.

- 1 12. The method of claim 1, wherein said stress engineering layer allows a direct band
- 2 gap of the Ge based layer of less than or equal to about 0.766 eV.
- 1 13. The method of claim 6, wherein said Ge based layer over said second surface is
- 2 removed by etching.
- 1 14. The method of claim 1 further comprising forming an oxide or nitride layer over said
- 2 Ge based layer followed by high temperature annealing.
- 1 15. A SiGe-containing structure comprising a substrate, a SiGe layer that is over a first
- 2 surface of said substrate, and a silicide or germanide layer that is over a second surface
- 3 of said substrate so to increase the tensile strain of the SiGe layer .
- 1 16. The SiGe-containing structure of claim 15, wherein said substrate comprises Si.
- 1 17. The SiGe-containing structure of claim 15, wherein said SiGe layer is formed using
- 2 ultra-high vacuum chemical vapor deposition (UHV-CVD).
- 1 18. The SiGe-containing structure of claim 15, wherein said silicide or germanide layer
- 2 is formed by depositing a Ti layer on said second surface of said substrate by evaporation
- 3 and then annealing at high temperature.
- 1 19. The SiGe-containing structure of claim 15, wherein said silicide or germanide layer
- 2 allows L-band photo-detection of said SiGe layer.
- 1 20. The SiGe-containing structure of claim 15 further comprising an oxide or nitride
- 2 layer over said SiGe layer .
- 1 21. A Ge-containing structure comprising: a substrate; a Ge layer that is over a first
- 2 surface of said substrate; and a silicide or germanide layer that is over a second surface
- 3 of said substrate so to increase the tensile strain of the Ge layer.
- 1 22. The Ge-containing structure of claim 21, wherein said substrate comprises Si.
- 1 23. The Ge-containing structure of claim 21, wherein said Ge layer is formed using
- 2 ultra-high vacuum chemical vapor deposition (UHV-CVD).

1 24. The Ge-containing structure of claim 21, wherein said silicide or germanide layer is
2 formed by depositing a Ti layer on said second surface of said substrate by evaporation
3 and then annealing at high temperature.

1 25. The Ge-containing structure of claim 21, wherein said silicide or germanide layer
2 allows L-band photo-detection of said Ge layer.

1 26. The Ge-containing structure of claim 21 further comprising an oxide or nitride layer
2 over said Ge layer .

1 28. A photodetector comprising a Ge-containing structure produced in accordance to
2 claim 1.

1 29. An optical modulator comprising a Ge-containing structure produced in accordance
2 to claim 1.